MONTANA NONPOINT SOURCE WATER QUALITY INVESTIGATIONS: 1992 MACROINVERTEBRATE ASSESSMENTS

prepared for
Montana Department of Health and Environmental Sciences
Water Quality Bureau

prepared by
Daniel L. McGuire
McGuire Consulting

April, 1994

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INTRODUCTION

The Montana Department of Health and Environmental Sciences - Water Quality Bureau's (WQB) Nonpoint Source Program utilizes aquatic macroinvertebrates to assess the biological condition of streams. Rapid Bioassessment Protocols (RBP) macroinvertebrate surveys are used to rank streams by degree of impairment and potential for improvement. These data are also used to document the effectiveness of "best management practices" and to evaluate the success of pollution control projects conducted under Section 319 of the Nonpoint Source Pollution Control Program.

This report presents macroinvertebrate-based RBP assessments of biological condition in 27 stream reaches during 1992. Streams were located throughout much of the state (Table 1).

METHODS

Field

A single travelling kick sample was collected by WQB staff from each stream reach. Qualitative samples of macroinvertebrates inhabiting riffles were obtained by disturbing (kicking) the substrate while traversing the the stream channel. Riffle habitats were sampled whenever possible. A standard D-net with 1 mm mesh was used to capture dislodged organisms. Site selection and sample collection are described in more detail by Bukantis (1993).

Habitat was characterized using either the nonpoint source stream reach assessment field report form or a modified version of the U.S. EPA Rapid Bioassessment Protocols (RBP) habitat form.

Table 1. 1992 RBP macroinvertebrate sampling locations.

Ecoregion	County	Sampling location	
Northern Rockies (#15)			
Dry Creek	Lincoln		@ HWY 56
Wolf Creek	Lincoln	nr mouth	650 ft downstream of Rd 736 bridge
Tobacco River	Lincoln	nr mouth	half way between mouth & HWY 37
Snowshoe Creek	Lincoln	downstream	below mine, lower end of reclamation
Snowshoe Creek	Lincoln	upstream	above mine and reclamation
Keeler Creek	Lincoln		half mile above S. Fork Keeler Cr.
Middle Rockies (#17)			
West Fork Rock Creek	Carbon	site 1	Silver Run Bridge
West Fork Rock Creek	Carbon	site 2	just above Rock Creek
Rock Creek	Carbon	site 6	above West Fork
Northern Montana Glaciated Plains (#41)			
Wood Isle Coulee	Blaine	North of Turn	100 ft above HWY 241 bridge
Northwestern Great Plains (#43)			
Musselshell River	Musselshell		@ HWY 12 crossing
Musselshell River	Petroleum		near the CMR
Little Dry Creek	Garfield	near mouth	
Armells Creek	Rosebud		above I-90
Little Powder River	Powder River	near mouth	
Mizpah Creek	Powder River	near mouth	
Little Porcupine Creek	Rosebud		@ gravel road crossing
Big Porcupine River	Rosebud	near mouth	
Montana Valley & Foothill Praires (#16)			
West Fork Bitterroot River	Ravalli		100 yds above W.F. Ranger stat. drive
Elkhorn Creek	Jefferson		2 mi. below Elkhorn City at crossing
Lower Deer Creek	Sweetgrass		75 ft above frontage road bridge
Upper Deer Creek	Sweetgrass		220 ft below frontage road bridge
Bridger Creek	Sweetgrass		120 yds above first road S of I-90
Redlodge Creek	Carbon		below Cooney Reservoir (reach 1)
Willow Creek	Carbon	nr mouth	@ Cooney Reservoir
Shields River	Park	upstream	at road crossing 3mi below Nat. Forest
Shields River	Park	downstream	near mouth

Laboratory

Laboratory and data analysis were contracted to McGuire Consulting. A 300 organism subsample was obtained from each sample using RBP III sorting methodology (Plafkin et al. 1989 - Appendix B.2). Samples were rinsed to remove the preservative and evenly distributed in a gridded enamel pan. All organisms within a randomly sellected grid were removed. This process was repeated until approximately 300 organisms were recovered. If the sample contained fewer than 300 organisms the entire sample was processed.

Macroinvertebrates were identified to the lowest practical taxonomic level, usually genus or species. Taxonomic resolution used in metric calculations were those recomended by Bukantis (1993).

Data Analysis

Macroinvertebrates

Macroinvertebrate data were analyzed to provide numerical estimates of biological integrity. The philosophy and mechanics of multiple-metric bioassessments are described in Plafkin et al. (1989). This approach is still being refined (Barbour et al. 1992) and analysis protocols for Montana streams continue to evolve (Bukantis 1993).

For RBP analyses, Montana streams have been grouped into three primary physiographic regions: mountains, foothills and valleys, and plains (Bahls et al. 1992). A separate set of metrics and scoring criteria was used for each of these ecoregions (Table 2). Each metric was assigned a score (0 to 6) based on its percent similarity to the reference value. Scores for all metrics were totaled and biolological integrity was expressed as a percentage of the maximum possible score. Criteria for classifying biological impairment (Table 3) are from Plafkin et al. (1989). The selection of metrics, reference values and scoring criteria were based on previous RBP studies in Montana (Wisseman 1992a & b, McGuire 1992 a-e). Most of the metrics used in this analysis are described in Plafkin et al. (1989), Hilsenhoff (1987), Shakleford (1988) or the Montana studies cited above.

Table 2. Metrics and scoring criteria for 300 organism RBP kick samples from plains, foothill and valley, and mountain streams in Montana.

Plains	Scoring Criteria			
metric	6	4	2	0
Taxa richness	>24	24 - 18	18 - 12	<12
EPT richness	>7	7 - 6	5 - 4	<4
Biotic index	<6	6 - 7	7 - 8	>8
% dominant taxon	<30	30-40	40-50	>50
% Collector-FFG	<70	70-85	85-95	>95
Hydropsychinae/Trichoptera	<0.8	0.8-0.9	0.9-0.97	>0.97

Foothill & Valley	Scoring Criteria			
metric	6	4	2	0
Taxa richness	>28	28-21	21-14	<14
EPT richness	>14	14-13	12 - 11	<11
Biotic index	<4	4 - 5	5 - 6	>6
% dominant taxon	<30	30-40	40-50	>50
% Collector-FFG	<60	60-75	75-90	>90
Hydropsychinae/Trichoptera	0.75	0.75-0.85	0.85-0.95	>0.95
Baetidae/Ephemeroptera	<0.8	0.8-0.9	0.9-0.98	>0.98
% Chironomidae	<30	30-40	40-50	>50

Mountain	Scoring Criteria			
metric	6	4	2	0
Taxa richness	>28	28-24	24-19	<19
EPT richness	>19	19-18	17-16	<16
Biotic index	<3	3 - 4	4 - 5	>5
% dominant taxon	<25	25-35	35-45	>45
% Collector-FFG	<60	60-70	70-80	>80
% Scrapers+Shredders	>55	55-40	40-25	<25
% Chironomidae	<25	25-35	35-45	>45

Table 3. Criteria for the assessment of biologically significant environmental degradation (from Plafkin et al 1989).

% comp. to reference	Classification
>83%	nonimpaired
54-79%	slightly impaired
21-50%	moderately impaired
<17%	severely impaired

The two metrics based on Functional Feeding Groups (FFG) are new, and address problems of high variability and limited applicability of previously used metrics (Barbour et al. 1992, Wisseman 1992a). For all three ecoregions, the relative abundance of collectors (gatherers + filterers) was used as an indicator of a truncated foodweb and reduced biological integrity. The relative abundance of specialist feeding guilds (scrapers + shredders) was used as a positive indicator of environmental condition in mountain streams. Functional feeding group assignments and biotic tolerance values were taken from Bukantis (1993).

A variety of other metrics were also calculated, including an experimental metals tolerance index (Appendix A). The basis for the metals tolerance index and most tolerance values were taken from investigations in the Clark Fork River Basin (McGuire 1993). While not incorporated into the RBP assessment, these metrics were used to further describe the community and provide insight to the types of impacts present.

Habitat

The RBP habitat assessments incorporated twelve parameters (Table 4). Scores for each parameter were summed to determine cumulative habitat condition. Habitat condition was categorized as optimal, suboptimal, fair or poor.

The nonpoint source stream assessments were evaluated to provide insight as to the type(s) and degree of habitat degradation. A numerical rating of habitat condition was not available for these data.

RESULTS and DISCUSSION

Plains streams

Bioassessment scores for plains streams ranged from 17 to 81% (Table 5).

Table 4. RBP habitat assessments for selected Montana streams, 1992.

Habitat metric:	1	2	3	4	5	6	7	8	9	10	11	12	Total	%
Maximum score:	20	20	20	20	15	15	15	10	10	10	10	10	175	100
Wood Isle Coulee	15	11	10	1	13	13	10	9	9	8	5	4	108	62%
West Fork Bitterroot R	16	15	16	20	8	12	7	6	9	8	6	8	131	75%
Tobacco River	16	15	16	5	9	10	11	5	6	9	9	8	119	68%
Wolf Creek	15	13	16	11	11	9	12	8	10	10	9	8	132	75%
Snowshoe Creek reclamation	20	19	6	0	8	5	3	2	8	4	0	0	75	43%

1 Bottom substrate	2 Embeddedness	3 Flow	4 Canopy cover
5 Channel morphology	6 Substrate stability	7 Pool/riffle ratio	8 Bank stability
9 Bank cover stability	10 Grazing pressure	11 Streamside cover	12 Riparian width

RATING (score): OPTIMAL 175-145, SUB-OPTIMAL 133-98, FAIR 86-51, POOR 39-0
RATING (%) OPTIMAL 100-83%, SUB-OPTIMAL 76-56%, FAIR 49-29%, POOR 22-0%

Table 5. Metric values and bioassessments for nine streams in Montana Plains ecoregions during 1992.

metric	stream								
	Wood Isle	Armells	L. Dry	Musselshell1	Musselshell2	L Powder	Mizpah	L. Porcupine	B. Porcupine
Taxa richness	18	16	6	10	8	19	16	12	30
EPT richness	6	3	3	4	3	4	3	5	9
Biotic index	5.9	6.1	5.0	5.0	4.6	5.9	6.7	5.2	6.3
% dominant taxon	35	43	94	66	81	38	21	74	35
% Collector-FFG	54	63	100	98	96	43	46	98	92
Hydropsychinae/Trich.	19	100	100	100	100	100	100	100	89
	metric score								
Taxa richness	3	2	0	0	0	4	2	2	6
EPT richness	4	0	0	2	0	2	0	2	6
Biotic index	6	4	6	6	6	6	4	6	4
% dominant taxon	4	2	0	0	0	4	6	0	4
% Collector-FFG	6	6	0	0	0	6	6	0	2
Hydropsychinae/Trich.	6	0	0	0	0	0	0	0	4
total score	29	14	6	8	6	22	18	10	26
% of reference	81%	39%	17%	22%	17%	61%	50%	28%	72%
classification*	NON/SLI	MOD	SEV	MOD/SEV	SEV	SLI	MOD	MOD	SLI

* classifications: (NON) nonimpaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired

AQUATIC MACROINVERTEBRATE DATA
Musselshell River @ HWY 12 crossing 10/1/92
RBP kick sample - 25 sec/15 ft. - subsample from ~500 organisms

Taxon	Number	%RA
COLEOPTERA		
Microcylloepus pus.	6	2.0%
Stenelmis sp.	26	8.6%
DIPTERA		
Cricotopus spp.	1	0.3%
Simulium sp.	2	0.7%
EPHEMEROPTERA		
Baetis sp.	2	0.7%
Chroroterpes a.	1	0.3%
TRICHOPTERA		
Cheumatopsyche sp.	198	65.6%
Hydropsyche bronta	31	20.2%
HEMIPTERA		
Ambrysus sp.	1	0.3%
OTHER		
Turbellaria	4	1.3%

ID's by D. McGuire
also present Paratanytarsus, Tubificidae

TOTAL ORGANISMS	302
TAXA RICHNESS	10
EPT RICHNESS	4
BIOTIC INDEX	4.98
SHANNON DIVERSITY	1.54
METALS TOLERANCE INDEX	4.55
EPT/(EPT + Chironomidae)	1.00
% DOMINANT TAXON	66%
% COLLECTOR-GATHERERS	12%
% SHREDDERS	0%
% SCRAPERS	0%
% FILTERERS	86%
% PREDATORS	2%
% CHIRONOMIDAE	0%
% COLEOPTERA	11%
% DIPTERA	1%
% EPHEMEROPTERA	1%
% TRICHOPTERA	86%
% misc NONINSECTS	1%
Baetidae/EPHEMEROPTERA	67%
Hydropsychinae/TRICH	100%

Wood Isle Coulee

This stream was sampled as a potential reference for the Northern Glaciated Plains ecoregion. The bioassessment score of 81% was the highest among the nine plains streams investigated and biointegrity was classified as non- to slightly impaired (Table 3). The RBP habitat assessment of 108 was 62% of the maximum possible score (Table 4). Habitat at this site was rated as suboptimal due, primarily, to the minimal stream flow (<1 cfs) and poor condition of riparian vegetation. Wood Isle Coulee appeared to be a good reference for plains streams.

Little Dry Creek

Biological integrity was severely impaired in Little Dry Creek. Five of six metrics received scores of 0 and the overall score of 17% was the lowest in this study. Only six macroinvertebrate taxa were present in the sample and *Cheumatopsyche* comprised 94% of the fauna. Impacts were primarily attributable to fine sediments which reduced microhabitat heterogeneity. Pool substrates were predominately fines while riffle gravel's were approximately 50% embedded and cemented in fines. Riparian vegetation consisted of grass, sedges and rushes which provided fair sediment filtering capacity. Stream banks and channel were moderately stabile. Natural and human-caused (grazing) erosion were moderate. Moderate salinization was indicated and poor water quality may have contributed to biological impairment.

Musselshell River

The Musselshell River was sampled at two locations. The upstream site (#1) was near Melstone at the Highway 12 crossing and the downstream site (#2) was near the CMR National Wildlife Refuge. The macroinvertebrate community was similar at both sites and diversity was low. Biological integrity was severely impaired at both sites and declined slightly from upstream (22%) to downstream (17%).

Natural erosion was severe in this river reach. Bank and channel stability were fair to poor. Grazing and non-irrigated crops planted to the stream edge were additional sources of nutrient and sediment pollution.

Lower Powder River

Biological integrity was slightly impaired (61%) in the Little Powder River. Impacts appeared to be attributable to natural causes including intermittent stream flow, moderate salinity and natural erosion in the watershed. Channel stability and riparian condition were good. Substrates were 50 to 100% embedded in fines.

Mizpah Creek

Biological integrity was moderately impaired (50%) in this ephemeral stream. The lack of flowing water, high salinity and moderate natural erosion were probable limiting factors. Nutrient/organic enrichment was indicated by the relatively high biotic index (Table 5). Bank and channel stability were fair to poor. The riparian zone was in fair condition. Instream substrates were dominated by fines, highly embedded and cemented.

Armells Creek

Biointegrity near the mouth of Armells Creek was 39% and classified as moderately impaired. Organic pollution and sedimentation were indicated as causes of reduced biointegrity. The nonpoint source stream reach assessment indicated that the channel stability was good to excellent, the riparian zone provided good sediment filtering capacity and the substrate was predominately fines. Poor water quality and the predominance of fine sediments may have been associated with irrigation returns which comprised much of the flow near the mouth.

Little Porcupine River

Biological integrity (28%) in the Little Porcupine River was near the lower end of the moderately impaired category. The fauna was dominated by *Cheumatopsyche* and diversity was low. Impacts were attributable to intermittent flows and excessive fine sediments. Natural erosion was severe and bank and channel stability was poor. Vegetation and sediment filtering capacity of the riparian zone was poor. Fine substrates predominated and riffle cobbles were 50% embedded in fines.

Big Porcupine River

The Big Porcupine River was slightly impaired but supported a diverse fauna and a high number of species (Table 5). Biointegrity was 72%. Taxa favored by fine substrates predominated and slight organic/nutrient enrichment was indicated.

Near the mouth, biological integrity may have been enhanced by ground water recharge from Yellowstone River irrigation water. In this reach, minor natural and man-made erosion was present. Bank and riparian condition was good to excellent. Channel stability was fair to good although fine substrates predominated. Further upstream, ephemeral stream flows and excessive sediment recruitment probably diminished biological integrity.

Foothill and Valley streams

Bioassessment scores for foothill and valley streams ranged from 42 to 96% (Table 6).

Bridger, Upper Deer and Lower Deer creeks

These three streams, located in Sweetgrass County, flooded during June, 1992. Physical impacts were similar in each stream and consisted primarily of severe scouring and deposition within the channel. However, biointegrity was significantly different among the three streams. Bridger Creek was nonimpaired with a RBP score of 96% while Upper and Lower Deer creeks were classified as slightly impaired with scores of 75 and 56%, respectively.

Following a flood, faunal composition can be quite dynamic and the RBP scores may reflect different recovery rates in the three streams. Alternatively, the range of biointegrity scores among the three streams may indicate differences in water quality rather than habitat condition.

Table 6. Metric values and bioassessments for nine streams in Montana Foothill and Valley ecoregions during 1992.

	stream								
metric	Bridger	Upper Deer	Lower Deer	Shields 2	Shields 1	Willow	Redlodge	Elkhorn	WF Bitterroot
Taxa richness	30	30	24	20	29	28	16	29	40
EPT richness	15	12	11	17	17	17	8	15	21
Biotic index	4.5	4.7	4.7	1.1	4.0	5.2	5.2	2.5	3.9
% dominant taxon	26	24	22	36	30	21	39	35	21
% Collector-FFG	54	76	79	12	65	72	93	43	76
Hydropsychinae/Trich.	0	0	25	0	90	79	99	0	70
Baetidae/Ephemeropter	37	68	90	0	17	56	29	3	21
% Chironomidae	19	37	51	1	8	54	19	19	33
			metric score						
Taxa richness	6	6	4	2	6	4	2	6	6
EPT richness	6	2	2	6	6	6	0	6	6
Biotic index	4	4	4	6	5	2	2	6	6
% dominant taxon	6	6	6	4	5	6	4	4	6
% Collector-FFG	6	2	2	6	4	4	0	6	2
Hydropsychinae/Trich.	6	6	6	6	2	4	0	6	6
Baetidae/Ephemeropter	6	6	3	6	6	6	6	6	6
% Chironomidae	6	4	0	6	6	0	6	6	4
total score	46	36	27	42	40	32	20	46	42
% of reference	96%	75%	56%	88%	83%	67%	42%	96%	88%
classification*	NON	SLI	SLI	NON	NON	SLI	MOD	NON	NON

* classifications: (NON) nonimpaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired

Redlodge Creek

Biointegrity was moderately impaired (42%) in Redlodge Creek. Reduced biointegrity was clearly due to a modified temperature regime, hydrograph and organic loading from Cooney Reservoir. The absence of stoneflies, low taxa richness and predominance of filter feeders were classic responses to an upstream impoundment. These alterations may overshadow more subtle impacts from nonpoint sources.

Willow Creek

Willow Creek, as it enters Cooney Reservoir, was slightly impaired with a biointegrity score of 67%. Nutrient enrichment and sediment deposition appeared to be the primary causes of biological impairment. Bank, channel and riparian condition were fair to good. Substrates were highly embedded and cemented in fines.

Shields River

Macroinvertebrates were collected at two sites on the Shields River. The lower site (#1) was near the confluence with the Yellowstone River while the upstream site (#2) was located approximately three miles below the National Forest boundary. Biological integrity was 83% at the lower site and 88% at the upper site. Both sites were classified as nonimpaired. The macroinvertebrate collections were quite different between sites with few taxa in common. The fauna at the upstream site was more typical of a mountain stream than a foothill stream and the differences between sites probably reflected significance changes in water temperature, water quality and habitat along the length of the stream.

Elkhorn Creek

The RBP sample was collected two miles below Elkhorn City. Although this was listed as a foothills stream the fauna was clearly that of a mountain stream. Bioassessments were made using both the foothill/valley (96% - nonimpaired) and mountain (74% - slightly impaired) criteria. The difference between the two assessments was primarily due to scoring criteria for the EPT richness metric. Based on the nonpoint source stream reach assessment, riparian condition, bank and channel stability were good. Riffle substrates were approximately 25% embedded.

This watershed has numerous sites of historic mining, particularly in the headwaters reach. However, the metals tolerance index (3.2) did not indicate significant metals pollution at the sampling site.

West Fork Bitterroot River

An RBP sample was collected in the West Fork Bitterroot River to determine impacts from landslides upstream of Painted Rock Reservoir. Based on a single sample, biointegrity (88%) was nonimpaired. The RBP habitat assessment indicated sub-optimal habitat (Table 4).

Mountain streams

Bioassessment scores ranged from 19 to 95% for the mountain streams investigated (Table 7).

Dry Creek

Dry Creek had a bioassessment score of 81% which falls between the nonimpaired and slightly impaired categories. The nonpoint source stream reach assessment indicated that habitat was good to excellent above the sample site. Intermittent flows may have accounted for the low number of macroinvertebrates in the sample (79 organisms), the relatively low taxa richness value, and the slightly depressed RBP score.

Table 7. Metric values and bioassessments for nine streams in Montana mountain ecoregions during 1992.

	stream								
metric	Dry	Wolf	Tobacco	Snowshoe 1	Snowshoe 2	Keele	WF Rock 1	WF Rock 3	Rock 6
Taxa richness	22	25	29	27	31	27	27	22	30
EPT richness	18	11	18	17	21	19	21	14	19
Biotic index	2.1	5.6	3.2	2.3	1.4	2.8	1.5	2.0	1.9
% dominant taxon	15	43	19	25	22	24	16	33	18
% Collector-FFG	32	73	52	25	33	42	43	47	38
% Scrapers + Shredders	44	24	27	39	46	40	47	48	54
% Chironomidae	15	65	5	15	4	16	12	3	10
	metric score								
Taxa richness	2	4	6	4	6	4	4	2	6
EPT richness	4	0	4	2	6	4	6	0	4
Biotic index	6	0	4	6	6	6	6	6	6
% dominant taxon	6	2	6	5	6	6	6	4	6
% Collector-FFG	6	2	6	6	6	6	6	6	6
% Scrapers + Shredders	4	0	2	2	4	3	4	4	4
% Chironomidae	6	0	6	6	6	6	6	6	6
total score	34	8	34	31	40	35	38	28	38
% of reference	81%	19%	81%	74%	95%	83%	90%	67%	90%
classification*	NON/SLI	MOD/SEV	NON/SLI	SLI	NON	NON/SLI	NON	SLI	NON

* classifications: (NON) nonimpaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired

Wolf Creek

The RBP sample from near the mouth of Wolf Creek indicated moderate to severe biological impairment. Poor water quality, rather than degraded habitat, appeared to be the primary cause of biological impairment. Organic/nutrient enrichment was clearly indicated. Upstream beaver dams seemed to be the most likely source of organics. Fine sediment deposition (embeddedness) and metals pollution may have caused additional impacts. The metals tolerance index of 6.3 was the highest recorded during this study. Riparian, bank and channel stability were considered good although the RBP habitat assessment (Table 4) of 75% was classified as sub-optimal.

Tobacco River

The RBP bioassessment (81%) classified the Tobacco River as non- to slightly impaired while the RBP habitat assessment (68%) indicated sub-optimal habitat. The habitat score was reduced primarily by relatively unstable banks and open canopy (Table 4).

Snowshoe Creek

This stream was sampled at the lower end of the Snowshoe mine reclamation area (site 1) and above the mine (site 2). Compared to the RBP mountain stream reference, the upstream site was nonimpaired (95%) while the downstream site was slightly impaired (74%). The downstream site was also classified as slightly impaired (64%) using the upstream site as a reference. Metals tolerance values were 1.9 for the upstream site and 3.1 for the downstream site. Both scores were relatively low and did not indicate significant metals pollution; however, the 63% increase in the index from the upstream site to the downstream site suggests a subtle increase in metals pollution in the reclamation area.

Reduced habitat quality in the reclamation area may also impair biological integrity. The RBP habitat assessment (46%) classified habitat condition in the reclamation area as fair (Table 4). The absence of riparian vegetation and unstable banks were identified as the primary factors reducing habitat quality. The nonpoint source stream reach assessment above the mine indicated stable banks and good riparian condition.

Keeler Creek

Biological integrity (83%) was classified as non- to slightly impaired. The nonpoint source stream reach assessment noted fair riparian condition, unstable banks, and severe scouring and deposition within the channel. However, significant biological impacts were not indicated.

Rock Creek and West Fork of Rock Creek

Three sites were sampled in the Rock Creek drainage. On the West Fork of Rock Creek, sites 1 and 3 were located at the Silver Run Bridge and near the mouth, respectively. Site 6 was on Rock Creel, above the West Fork.

These sites were listed as foothill streams; however, the macroinvertebrate fauna was more typical of mountain streams. Using the criteria for mountain streams, biointegrity was 90% and nonimpaired at sites 1 and 6 while site 3, with a score of 67%, was slightly impaired. RBP assessments based on Foothill and Valley criteria classified all three sites as nonimpaired and resulted in scores of 96, 88 and 100% for sites 1, 3 and 6, respectively.

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APPENDIX A

Macroinvertebrate data - plains streams 1992

A.1 Checklist with FFG designations, metals and biotic index tolerance values

A.2 Raw data and metrics

Appendix A.1. Checklist of macroinvertebrates from plains streams with Functional Feeding Group (FFG) designations, metals (MTI) and biotic (BI) tolerance values.

Taxon	FFG	MTI	BI	Taxon	FFG	MTI	BI
COLEOPTERA				TRICHOPTERA			
Dubiraphia sp.	4	4	6	*Cheumatopsyche sp.*	2	5	5
Microcylloepus pus.	4	3	5	*Hydropsyche bronta*	2	4	5
Optioservus sp.	4	5	5	*Hydroptila sp.*	4	4	6
Stenelmis sp.	4	3	5	*Polycentropus sp.*	5	1	6
Curculionidae				*Mystacides sp.*	4	3	4
Gyrinus sp.	4	3	5	*Helicopsyche b.*	1	3	3
DIPTERA				HEMIPTERA			
Ablabesmyia sp.	5	3	8	*Ambrysus sp.*	5	3	3
Larsia sp.	5	3	6	*Gerris sp.*	5	3	5
Pentaneura sp.	5	2	6	*Notonecta sp.*	5	3	5
Thienemannimyia gp.	5	4	5	*Palmacorixa gilletti*	5	3	5
Potthastia sp.	4	5	2	*Sigara sp.*	5	3	5
Cricotopus spp.	4	9	7				
Chironomus sp.	4	4	10	MEGALOPTERA			
Cryptochironomus sp.	4	4	8	*Sialis sp.*	5	4	4
Dicrotendipes sp.	4	5	8				
Polypedilum sp.	4	4	6	ODONATA			
Psuedochironomus sp.	4	4	5	*Enallagma sp.*	5	3	7
Paratanytarsus sp.	4	2	6	*Ischnura sp.*	5	3	7
Rheotanytarsus sp.	2	1	6	*Hetaerina americana*	5	3	7
Tanytasus sp.	2	3	6	Ceonagrionidae	5	3	7
Tabanidae	5	3	6				
Ormosia sp.	3	2	6	CRUSTACEA			
Tipula sp.	3	4	4	*Gammarus sp.*	3	1	4
Empididae	5	4	6	*Hyallela azteca*	4	3	8
Ceratopogoninae	5	4	6	*Caecitodea sp.*	4	5	8
Simulium	2	5	5				
				MOLLUSCA			
EPHEMEROPTERA				*Gyraulus sp.*	1	3	8
Baetis sp.	4	4	5	*Ferrissia sp.*	1	1	6
Callibaetis sp.	4	1	9	Physidae	1	3	8
Caenis sp.	4	3	7				
Nixe sp.	1	1	4	ANNELIDA			
Choroterpes a.	4	1	2	*Helobdella stagnalis*	5	3	10
Leptophlebia sp.	4	1	3	Erpobdellidae	5	3	8
Traverella sp.	2	1	2	Tubificidae	4	6	10
Siphlonurus sp.	4	1	4				
Tricorythodes sp.	4	4	4	TURBELLARIA	5	4	4

ID's by D. McGuire

FFG: scraper = 1, filterer = 2, shredder = 3, collector-gatherer = 4, predator = 5

APPENDIX A.2

Macroinvertebrate data
plains streams 1992

raw data and metrics

Armells Creek

Big Porcupine River

Little Dry Creek

Little Porcupine River

Little Powder River

Mizpah Creek

Musselshell River #1

Musselshell River #2

Wood Isle Coulee

AQUATIC MACROINVERTEBRATE DATA
Armells Creek above I-90 10/6/92
RBP kick sample - 40 sec/20 ft subsample from > 1000 organisms

Taxon	Number	%RA
COLEOPTERA		
Dubiraphia sp.	3	1.0%
Gyrinus sp.	1	0.3%
DIPTERA		
Tabanidae	2	0.7%
Tipula sp.	1	0.3%
Simulium sp.	17	5.7%
Ceratopoginae	1	0.3%
EPHEMEROPTERA		
Caenis sp.	5	1.7%
TRICHOPTERA		
Cheumatopsyche sp.	128	43.0%
Hydropsyche bronta	33	11.1%
HEMIPTERA		
Ambrysus sp.	1	0.3%
Notonecta sp.	1	0.3%
Sigara sp.	2	0.7%
ODONATA		
Ischnura sp.	2	0.7%
Hetaerina americana	4	1.3%
MOLLUSCA		
Physidae	96	32.2%
ANNELIDA		
Tubificidae	1	0.3%

ID's by D. McGuire
also present: Sialis, Microcylloepus, Cricotopus + plains killifish (Fundulus kansae)

AQUATIC MACROINVERTEBRATE DATA
Armells Creek above I-90 10/6/92
RBP kick sample - 40 sec/20 ft subsample from > 1000 organisms

TOTAL ORGANISMS	298
TAXA RICHNESS	16
EPT RICHNESS	3
BIOTIC INDEX	6.11
SHANNON DIVERSITY	2.20
METALS TOL. INDEX	4.10
EPT/(EPT + Chironomidae)	1.00
% DOMINANT TAXON	43%
% COLLECTOR-GATHERERS	3%
% SHREDDERS	0%
% SCRAPERS	32%
% FILTERERS	60%
% PREDATORS	4%
% CHIRONOMIDAE	0%
% COLEOPTERA	1%
% DIPTERA	7%
% EPHEMEROPTERA	2%
% PLECOPTERA	0%
% TRICHOPTERA	54%
% misc INSECTS	3%
% ANNELIDA	0%
% MOLLUSCA	32%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	0%
Hydropsychinae/TRICH	100%

AQUATIC MACROINVERTEBRATE DATA
Big Porcupine Creek near mouth 8/31/92
RBP kick sample - 40 sec/50 ft subsample from ~400 organisms

Taxon	Number	%RA
COLEOPTERA		
Dubiraphia sp.	7	2.2%
Stenelmis sp.	1	0.3%
DIPTERA		
Ablabesmyia sp.	2	0.6%
Larsia sp.	1	0.3%
Pentaneura sp.	4	1.3%
Thienemannimyia gp.	6	1.9%
Cricotopus spp.	109	34.9%
Chironomus sp.	4	1.3%
Cryptochironomus sp.	6	1.9%
Dicrotendipes sp.	10	3.2%
Polypedilum sp.	12	3.8%
Rheotanytarsus sp.	12	3.8%
Tanytasus sp.	12	3.8%
Simulium sp.	7	2.2%
EPHEMEROPTERA		
Baetis sp.	1	0.3%
Caenis sp.	20	6.4%
Nixe sp.	5	1.6%
Choroterpes a.	5	1.6%
Traverella sp.	1	0.3%
Tricorythodes sp.	1	0.3%
TRICHOPTERA		
Cheumatopsyche sp.	38	12.2%
Hydropsyche bronta	21	6.7%
Hydroptila sp.	7	2.2%
HEMIPTERA		
Sigara sp.	1	0.3%
MEGALOPTERA		
Sialis sp.	1	0.3%
CRUSTACEA		
Caecitodea sp.	10	3.2%
MOLLUSCA		
Ferrissia sp.	1	0.3%
Physidae	1	0.3%
ANNELIDA		
Helobdella stagnalis	1	0.3%
Tubificidae	5	1.6%

AQUATIC MACROINVERTEBRATE DATA
Big Porcupine Creek near mouth 8/31/92
RBP kick sample - 40 sec/50 ft subsample from ~400 organisms

TOTAL ORGANISMS	312
TAXA RICHNESS	30
EPT RICHNESS	9
BIOTIC INDEX	6.27
SHANNON DIVERSITY	3.62
METALS TOL. INDEX	5.18
EPT/(EPT + Chironomidae)	0.36
% DOMINANT TAXON	35%
% COLLECTOR GATHERERS	63%
% SHREDDERS	0%
% SCRAPERS	2%
% FILTERERS	29%
% PREDATORS	5%
% CHIRONOMIDAE	57%
% COLEOPTERA	3%
% DIPTERA	59%
% EPHEMEROPTERA	11%
% TRICHOPTERA	21%
% misc INSECTS	1%
% ANNELIDA	2%
% MOLLUSCA	1%
% CRUSTACEA	3%
Baetidae/EPHEMEROPTERA	3%
Hydropsychinae/TRICH	89%

AQUATIC MACROINVERTEBRATE DATA
Little Dry Creek near mouth 8/29/92
RBP kick sample - 75 sec/35 ft subsample from ~ 1000 organisms

Taxon	Number	%RA
DIPTERA		
Cricotopus spp.	1	0.3%
Psuedochironomus sp.	3	1.0%
EPHEMEROPTERA		
Baetis sp.	1	0.3%
TRICHOPTERA		
Cheumatopsyche sp.	269	94.1%
Hydropsyche bronta	11	3.8%
HEMIPTERA		
Ambrysus sp.	1	0.3%

ID's by D. McGuire

TOTAL ORGANISMS	286
TAXA RICHNESS	6
EPT RICHNESS	3
BIOTIC INDEX	5.01
SHANNON DIVERSITY	0.42
METALS TOL. INDEX	4.95
EPT/(EPT + Chironomidae)	0.99
% DOMINANT TAXON	94%
% COLLECTOR-GATHERERS	2%
% SHREDDERS	0%
% SCRAPERS	0%
% FILTERERS	98%
% PREDATORS	0%
% CHIRONOMIDAE	1%
% COLEOPTERA	0%
% DIPTERA	1%
% EPHEMEROPTERA	0%
% PLECOPTERA	0%
% TRICHOPTERA	98%
Baetidae/EPHEMEROPTERA	100%
Hydropsychinae/TRICH	100%

AQUATIC MACROINVERTEBRATE DATA
Little Porcupine Creek @ gravel road crossing 9/1/92
RBP kick sample - 40 sec/50 ft subsample from ~ 500 organisms

Taxon	Number	%RA
COLEOPTERA		
Stenelmis sp.	2	0.7%
DIPTERA		
Larsia sp.	3	1.1%
Cricotopus spp.	2	0.7%
Polypedilum sp.	4	1.5%
Tanytasus sp.	5	1.8%
Simulium sp.	40	14.5%
EPHEMEROPTERA		
Caenis sp.	1	0.4%
Nixe sp.	1	0.4%
Choroterpes p	3	1.1%
TRICHOPTERA		
Cheumatopsycne sp.	203	73.8%
Hydropsyche bronta	10	3.6%
HEMIPTERA		
Ambrysus sp.	1	0.4%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Little Porcupine Creek @ gravel road crossing 9/1/92
RBP kick sample - 40 sec/50 ft subsample from ~ 500 organisms

TOTAL ORGANISMS	275
TAXA RICHNESS	12
EPT RICHNESS	5
BIOTIC INDEX	5.17
SHANNON DIVERSITY	1.43
METALS TOL. INDEX	4.83
EPT/(EPT + Chironomidae)	0.94
% DOMINANT TAXON	74%
% COLLECTOR-GATHERERS	4%
% SHREDDERS	0%
% SCRAPERS	0%
% FILTERERS	94%
% PREDATORS	1%
% CHIRONOMIDAE	5%
% COLEOPTERA	1%
% DIPTERA	20%
% EPHEMEROPTERA	2%
% PLECOPTERA	0%
% TRICHOPTERA	77%
Baetidae/EPHEMEROPTERA	0%
Hydropsychinae/TRICH	100%

AQUATIC MACROINVERTEBRATE DATA
Little Powder River near mouth 8/24/92
RBP kick sample - 40 sec/50 ft entire sample used

Taxon	Number	%RA
COLEOPTERA		
Dubiraphia sp.	4	1.4%
DIPTERA		
Ablabesmyia sp.	5	1.8%
Cricotopus spp.	1	0.4%
Dicrotendipes sp.	2	0.7%
Polypedilum sp.	2	0.7%
Psuedochironomus sp.	35	12.5%
Paratanytarsus sp.	10	3.6%
Empididae	1	0.4%
EPHEMEROPTERA		
Callibaetis sp.	3	1.1%
Caenis sp.	56	20.0%
Nixe sp.	6	2.1%
Leptophlebia sp.	1	0.4%
HEMIPTERA		
Ambrysus sp.	1	0.4%
Corrixidae nymphs	107	38.2%
ODONATA		
Ischnura sp.	1	0.4%
Enallagma sp.	7	2.5%
MEGALOPTERA		
Sialis sp.	9	3.2%
CRUSTACEA		
Hyallela azteca	5	1.8%
MOLLUSCA		
Physidae	24	8.6%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Little Powder River near mouth 8/24/92
RBP kick sample - 40 sec/50 ft entire sample used

TOTAL ORGANISMS	280
TAXA RICHNESS	19
EPT RICHNESS	4
BIOTIC INDEX	5.89
SHANNON DIVERSITY	2.87
METALS TOL. INDEX	3.08
EPT/(EPT + Chironomidae)	0.55
% DOMINANT TAXON	38%
% COLLECTOR-GATHERERS	43%
% SHREDDERS	0%
% SCRAPERS	11%
% FILTERERS	0%
% PREDATORS	47%
% CHIRONOMIDAE	20%
% COLEOPTERA	1%
% DIPTERA	20%
% EPHEMEROPTERA	24%
% PLECOPTERA	0%
% TRICHOPTERA	0%
% misc INSECTS	45%
% ANNELIDA	0%
% MOLLUSCA	9%
% CRUSTACEA	2%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	5%
Hydropsychinae/TRICH	default = 1

AQUATIC MACROINVERTEBRATE DATA
Mizpah Creek near mouth 8/26/92
RBP kick sample - entire sample used

Taxon	Number	%RA
COLEOPTERA		
Dubiraphia sp.	3	5.8%
Curclionidae	1	1.9%
Gyrinus sp.	1	1.9%
DIPTERA		
Ablabesmyia sp.	1	1.9%
Cricotopus spp.	2	3.8%
Tabanidae	1	1.9%
Ormosia sp.	1	1.9%
Simulium sp.	1	1.9%
EPHEMEROPTERA		
Callibaetis sp.	5	9.6%
Caenis sp.	9	17.3%
TRICHOPTERA		
Cheumatopsyche sp.	2	3.8%
HEMIPTERA		
Gerris sp.	1	1.9%
Palmacorixa gilletti	4	7.7%
Sigara sp.	3	5.8%
ODONATA		
Ceonagrionidae	11	21.2%
MOLLUSCA		
Physidae	6	11.5%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Mizpah Creek near mouth 8/26/92
RBP kick sample - entire sample used

TOTAL ORGANISMS	52
TAXA RICHNESS	16
EPT RICHNESS	3
BIOTIC INDEX	6.73
SHANNON DIVERSITY	3.48
METALS TOL. INDEX	3.19
EPT/(EPT + Chironomidae)	0.84
% DOMINANT TAXON	21%
% COLLECTOR-GATHERERS	40%
% SHREDDERS	2%
% SCRAPERS	12%
% FILTERERS	6%
% PREDATORS	40%
% CHIRONOMIDAE	6%
% COLEOPTERA	10%
% DIPTERA	12%
% EPHEMEROPTERA	27%
% PLECOPTERA	0%
% TRICHOPTERA	4%
% misc INSECTS	37%
% ANNELIDA	0%
% MOLLUSCA	12%
Baetidae/EPHEMEROPTERA	36%
Hydropsychinae/TRICH	100%

AQUATIC MACROINVERTEBRATE DATA
Musselshell River near the CMR 10/1/92
RBP kick sample - 45 sec/20 ft - entire sample used

Taxon	Number	%RA
COLEOPTERA		
Microcylloepus pus.	1	0.4%
DIPTERA		
Thienemannimyia gp.	1	0.4%
Paratanytarsus sp.	1	0.4%
Simulium sp.	3	1.1%
EPHEMEROPTERA		
Choroterpes a.	33	12.4%
TRICHOPTERA		
Cheumatopsyche sp.	216	81.2%
Hydropsyche bronta	3	1.1%
HEMIPTERA		
Ambrysus sp.	8	3.0%

ID's by D. McGuire

TOTAL ORGANISMS	266
TAXA RICHNESS	8
EPT RICHNESS	3
BIOTIC INDEX	4.57
SHANNON DIVERSITY	1.01
METALS TOL. INDEX	4.41
EPT/(EPT + Chironomidae)	0.99
% DOMINANT TAXON	81%
% COLLECTOR-GATHERERS	13%
% SHREDDERS	0%
% SCRAPERS	0%
% FILTERERS	83%
% PREDATORS	3%
% CHIRONOMIDAE	1%
% DIPTERA	2%
% EPHEMEROPTERA	12%
% TRICHOPTERA	82%
% misc INSECTS	3%
Baetidae/EPHEMEROPTERA	0%
Hydropsychinae/TRICH	100%

AQUATIC MACROINVERTEBRATE DATA
Wood Isle Coulee 100 ft above HWY241 bridge N. of Turner 7/16/92
RBP kick sample - 90 sec/27 ft subsample from >2000 organisms

Taxon	Number	%RA
COLEOPTERA		
Optioservus sp.	29	10.7%
DIPTERA		
Potthastia sp.	1	0.4%
Cricotopus spp.	2	0.7%
EPHEMEROPTERA		
Caenis sp.	14	5.2%
Siphlonurus sp.	1	0.4%
TRICHOPTERA		
Cheumatopsyche sp.	3	1.1%
Polycentropus sp.	2	0.7%
Mystacides sp.	5	1.9%
Helicopsyche b.	6	2.2%
HEMIPTERA		
Sigara sp.	5	1.9%
ODONATA		
Ischnura sp.	2	0.7%
Enallagma sp.	2	0.7%
CRUSTACEA		
Gammarus sp.	94	34.8%
Hyallela azteca	91	33.7%
MOLLUSCA		
Gyraulus sp.	7	2.6%
Physidae	1	0.4%
ANNELIDA		
Helobdella stagnalis	2	0.7%
Erpobdellidae	3	1.1%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Wood Isle Coulee 100 ft above HWY241 bridge N. of Turner 7/16/92

RBP kick sample - 90 sec/27 ft subsample from >2000 organisms

TOTAL ORGANISMS	270
TAXA RICHNESS	18
EPT RICHNESS	6
BIOTIC INDEX	5.85
SHANNON DIVERSITY	2.59
METALS TOL. INDEX	2.57
EPT/(EPT + Chironomidae)	0.91
% DOMINANT TAXON	35%
% COLLECTOR-GATHERERS	53%
% SHREDDERS	35%
% SCRAPERS	5%
% FILTERERS	1%
% PREDATORS	6%
% CHIRONOMIDAE	1%
% COLEOPTERA	11%
% DIPTERA	1%
% EPHEMEROPTERA	6%
% PLECOPTERA	0%
% TRICHOPTERA	6%
% misc INSECTS	3%
% ANNELIDA	2%
% MOLLUSCA	3%
% CRUSTACEA	69%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	0%
Hydropsychinae/TRICH	19%

APPENDIX B

Macroinvertebrate data - mountain streams 1992

B.1 Checklist with FFG designations, metals and biotic index tolerance values

B.2 Raw data and metrics

Appendix B.1. Checklist of macroinvertebrates from mountain streams with Functional Feeding Group (FFG) designations, metals (MTI) and biotic (BI) tolerance values.

Taxon	FFG	MTI	BI
COLEOPTERA			
Heterlimnius corp.	4	3	3
Optioservus spp.	1	5	5
Zaitzevia parvula	4	3	4
Deronectes sp.	5	7	5
Heteroceridae	5		
Curculionidae	3		
DIPTERA			
Thienemannimyia gp.	5	4	5
Pagastia sp.	4	9	1
Pottha..ia sp.	4	5	2
Brillia sp.	3	4	4
Corynoneura sp.	4	4	7
Cri.otopus spp.	4	9	7
Cricotopus nostococladius	3	5	6
Eukiefferiella spp.	4	9	8
Nanocladius sp.	4	4	3
Orthocladius spp.	4	5	6
Rheocricotopus sp.	4	5	4
Tvetenia sp.	4	4	5
Polypedilum sp.	4	4	6
Micropsectra spp.	4	1	4
Rheotanytarsus sp.	2	1	6
Antocha sp.	4	4	3
Hexatoma sp.	5	2	2
Simulium spp. (Eusimulii	2	5	5
Deuterphlebia sp.	1	0	0
Atherix sp.	5	5	5
Oreogeton sp.	5	7	4
Clinocera sp.	5	6	5
Chelifera sp.	5	6	5

Taxon	FFG	MTI	BI
EPHEMEROPTERA			
Acentrella insignificans	4	4	4
Baetis bicaudatus	4	4	2
Baetis tricaudatus	4	5	4
Ameletus spp.	4	1	0
Serratella sp.	4	1	2
Drunella coloradensis	1	0	0
Drunella doddsi	1	0	1
Caudatella hystrix	1	0	0
Ephemerella inermis	4	3	4
Timpanoga hecuba	4	1	2
Cinygmula spp.	1	0	0
Epeorus longimanus	1	0	1
Epeorus grandis	1	0	0
Epeorus deceptivus	1	0	0
Ironodes sp.	1	0	0
Nixe sp.	1	1	4
Rhithrogena sp.	1	2	0
Paraleptophlebia sp.	4	1	1
PLECOPTERA			
Calineuria californica	5	3	2
Claassenia sabulosa	5	3	3
Doroneuria sp.	5	2	0
Hesperoperla pacifica	5	3	1
Leuctridae	3	0	0
Pteronarcys sp.	3	2	2
Malenka sp.	3	1	1
Visoka cateractae	3	0	0
Zapada cinctipes	3	3	3
Zapada columbiana	3	1	2
Zapada oregenensis gp.	3	1	2
Megarcys sp.	5	1	1
Setvena bradleyi	5	1	0
Skwala sp.	5	3	3
Isoperla sp.	5	3	2
Yoraperla sp.	3	0	0
Chloroperlinae	5	2	1

Appendix B.1. Checklist of macroinvertebrates from mountain streams with Functional Feeding Group (FFG) designations, metals (MTI) and biotic (BI) tolerance values.

Taxon	FFG	MTI	BI	Taxon	FFG	MTI	BI
TRICHOPTERA				LEPIDOPTERA			
Cheumatopsyche sp.	2	5	5	*Petrophila sp.*	1	3	5
Hydropsyche oslari	2	5	3				
Arctopsyche sp.	2	3	2	ANNELIDA			
Parapsyche sp.	2	1	0	Lumbricidae	4	1	4
Apatania sp.	1	2	3	Naididae	4	5	8
Oligophlebodes sp.	1	1	3				
Dicosmoecus sp.	1	1	2	Turbellaria	5	4	4
Ecclisomyia sp.	4	2	4				
Neothremma sp.	1	1	1				
Neophylax sp.	1	2	3				
Psychoglypha sp.	4	2	0				
Agraylea sp.	3	2	8				
Leucotrichia sp.	1	1	2				
Ochrotrichia sp.	3	3	4				
Brachycentrus americanu	1	4	1				
Brachycentrus occidental	2	3	2				
Dolophilodes sp.	2	1	0				
Lepidostoma sp.	3	1	1				
Glossosoma sp.	1	2	0				
Rhyacophila angelita gp.	5	1	0				
Rhyacophila betteni gp.	5	1	0				
Rhyacophila brunnea gp.	5	1	2				
Rhyacophila coloradensis	5	1	0				
Rhyacophila hylinata gp.	5	1	0				
Rhyacophila sibirica gp.	5	1	0				

ID's by D. McGuire

FFG: scraper = 1, filterer = 2, shredder = 3, collector-gatherer = 4, preditor = 5

APPENDIX B.2

Macroinvertebrate data
mountain streams 1992

raw data and metrics

Dry Creek

Keeler Creek

Rock Creek #6

West Fork Rock Creek #1

West Fork Rock Creek #3

Snowshoe Creek #1

Snowshoe Creek #2

Tobacco River

Wolf Creek

AQUATIC MACROINVERTEBRATE DATA
Dry Creek - Lincoln County @ HW56 - 9/16/92
RBP kick sample -40 sec/50 ft entire sample used.

Taxon	Number	%RA
DIPTERA		
Thienemannimyia gp.	8	10.1%
Corynoneura sp.	1	1.3%
Tvetenia sp.	1	1.3%
Polypedilum sp.	2	2.5%
EPHEMEROPTERA		
Ameletus spp.	2	2.5%
Drunella doddsi	1	1.3%
Drunella spinifera	1	1.3%
Ephemerella inermis	11	13.9%
Cinygmula spp.	1	1.3%
Ironodes sp.	1	1.3%
Rhithrogena sp.	1	1.3%
PLECOPTERA		
Doroneuria sp.	4	5.1%
Visoka cataractae	12	15.2%
Zapada cinctipes	10	12.7%
Zapada columbiana	5	6.3%
Megarcys sp.	1	1.3%
Isoperla sp.	1	1.3%
Chloroperlinae	4	5.1%
TRICHOPTERA		
Parapsyche sp.	5	6.3%
Dolophilodes sp.	1	1.3%
Lepidostoma sp.	4	5.1%
Rhyacophila brunnea gp.	1	1.3%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Dry Creek - Lincoln County @ HW56 - 9/16/92

RBP kick sample -40 sec/50 ft entire sample used.

TOTAL ORGANISMS	79
TAXA RICHNESS	22
EPT RICHNESS	18
BIOTIC INDEX	2.06
SHANNON DIVERSITY	3.86
METALS TOLERANCE INDEX	1.92
EPT/(EPT + Chironomidae)	0.85
% DOMINANT TAXON	15%
% COLLECTOR-GATHERERS	23%
% SHREDDERS	39%
% SCRAPERS	5%
% FILTERERS	9%
% PREDATORS	24%
% CHIRONOMIDAE	15%
% COLEOPTERA	0%
% DIPTERA	15%
% EPHEMEROPTERA	23%
% PLECOPTERA	47%
% TRICHOPTERA	15%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	0%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
Keeler Creek 1/2 mile above S. Fork Keeler Cr. 9/17/92
RBP kick sample -40 sec/ 50 ft- entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Heterlimnius corp.	3	1.4%
DIPTERA		
Pagastia sp.	1	0.5%
Cricotopus spp.	15	6.8%
Eukiefferiella spp.	5	2.3%
Orthocladius spp.	3	1.4%
Tvetenia sp.	10	4.5%
Micropsectra spp.	1	0.5%
Hexatoma sp.	1	0.5%
EPHEMEROPTERA		
Baetis tricaudatus	37	16.8%
Drunella doddsi	53	24.1%
Caudatella hystrix	3	1.4%
Cinygmula spp.	1	0.5%
Epeorus longimanus	3	1.4%
Rhithrogena sp.	6	2.7%
Paraleptophlebia sp.	1	0.5%
PLECOPTERA		
Doroneuria sp.	10	4.5%
Zapada cinctipes	2	0.9%
Zapada columbiana	2	0.9%
Megarcys sp.	8	3.6%
Skwala sp.	11	5.0%
TRICHOPTERA		
Arctopsyche sp.	14	6.4%
Parapsyche sp.	2	0.9%
Apatania sp.	11	5.0%
Agrayles sp.	4	1.8%
Glossosoma sp.	3	1.4%
Rhyacophila betteni gp.	2	0.9%
Rhyacophila brunnea gp.	8	3.6%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Keeler Creek 1/2 mile above S. Fork Keeler Cr. 9/17/92
RBP kick sample -40 sec/ 50 ft- entire sample used.

TOTAL ORGANISMS	220
TAXA RICHNESS	27
EPT RICHNESS	19
BIOTICINDEX	2.78
SHANNON DIVERSITY	3.85
METALS TOLERANCE INDEX	2.72
EPT/(EPT + Chironomidae)	0.84
% DOMINANT TAXON	24%
% COLLECTOR-GATHERERS	35%
% SHREDDERS	4%
% SCRAPERS	36%
% FILTERERS	7%
% PREDATORS	18%
% CHIRONOMIDAE	16%
% COLEOPTERA	1%
% DIPTERA	16%
% EPHEMEROPTERA	47%
% PLECOPTERA	15%
% TRICHOPTERA	20%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	36%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
Rock Creek above West Fork - Site 06- 8/5/92
RBP kick sample - 60 sec/30 ft - entire sample used.

Taxon	Number	%RA
DIPTERA		
Brillia sp.	2	0.7%
Cricotopus spp.	7	2.5%
Eukiefferiella spp.	5	1.8%
Orthocladius spp.	2	0.7%
Tvetenia sp.	4	1.4%
Polypedilum sp.	1	0.4%
Micropsectra spp.	7	2.5%
Rheotanytarsus sp.	1	0.4%
Antocha sp.	1	0.4%
Deuterophlebia sp.	1	0.4%
Simulium spp. (Eusimulium)	7	2.5%
EPHEMEROPTERA		
Baetis tricaudatus	50	17.7%
Serratella sp.	22	7.8%
Drunella coloradensis	16	5.7%
Drunella doddsi	10	3.5%
Cinygmula spp.	36	12.7%
Epeorus longimanus	41	14.5%
Epeorus grandis	1	0.4%
Epeorus deceptivus	34	12.0%
Rhithrogena sp.	5	1.8%
PLECOPTERA		
Hesperoperla pacifica	1	0.4%
Malenka sp.	2	0.7%
Zapada cinctipes	1	0.4%
Zapada columbiana	1	0.4%
Chloroperlinae	6	2.1%
TRICHOPTERA		
Brachycentrus americanus	4	1.4%
Dolophilodes sp.	1	0.4%
Rhyacophila brunnea gp.	9	3.2%
Rhyacophila hylinata gp.	1	0.4%
Rhyacophila sibirica gp.	4	1.4%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Rock Creek above West Fork - Site 06- 8/5/92
RBP kick sample - 60 sec/30 ft - entire sample used.

TOTAL ORGANISMS	283
TAXA RICHNESS	30
EPT RICHNESS	19
BIOTIC INDEX	1.92
SHANNON DIVERSITY	3.86
METALS TOLERANCE INDEX	1.85
EPT/(EPT + Chironomidae)	0.89
% DOMINANT TAXON	18%
% COLLECTOR-GATHERERS	35%
% SHREDDERS	2%
% SCRAPERS	52%
% FILTERERS	3%
% PREDATORS	7%
% CHIRONOMIDAE	10%
% COLEOPTERA	0%
% DIPTERA	13%
% EPHEMEROPTERA	76%
% PLECOPTERA	4%
% TRICHOPTERA	7%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	23%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
West Fork Rock Creek - Site 01 - Silver Run Bridge- 8/5/92
RBP kick sample- subsample from ~ 500 organisms

Taxon	Number	%RA
DIPTERA		
Orthocladius spp.	8	2.8%
Tvetenia sp.	3	1.1%
Micropsectra spp.	22	7.8%
Deuterophlebia sp.	1	0.4%
Hexatoma sp.	1	0.4%
EPHEMEROPTERA		
Baetis bicaudatus	44	15.5%
Baetis tricaudatus	21	7.4%
Ameletus spp.	9	3.2%
Serratella sp.	14	4.9%
Drunella coloradensis	20	7.1%
Drunella doddsi	1	0.4%
Cinygmula spp.	27	9.5%
Epeorus longimanus	3	1.1%
Epeorus grandis	3	1.1%
Epeorus deceptivus	34	12.0%
Rhithrogena sp.	1	0.4%
PLECOPTERA		
Doroneuria sp.	12	4.2%
Zapada cinctipes	1	0.4%
Zapada oregonensis gp.	1	0.4%
Megarcys sp.	1	0.4%
TRICHOPTERA		
Parapsyche sp.	1	0.4%
Neothremma sp.	39	13.8%
Rhyacophila betteni gp.	1	0.4%
Rhyacophila brunnea gp.	9	3.2%
Rhyacophila hyalinata gp.	4	1.4%
Rhyacophila sibirica gp.	1	0.4%
ANNELIDA		
Lumbriculidae	1	0.4%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
West Fork Rock Creek - Site 01 - Silver Run Bridge- 8/5/92
RBP kick sample- subsample from ~ 500 organisms

TOTAL ORGANISMS	283
TAXA RICHNESS	27
EPT RICHNESS	21
BIOTIC INDEX	1.50
SHANNON DIVERSITY	3.82
METALS TOLERANCE INDEX	1.65
EPT/(EPT + Chironomidae)	0.88
% DOMINANT TAXON	16%
% COLLECTOR-GATHERERS	43%
% SHREDDERS	1%
% SCRAPERS	46%
% FILTERERS	0%
% PREDATORS	10%
% CHIRONOMIDAE	12%
% COLEOPTERA	0%
% DIPTERA	12%
% EPHEMEROPTERA	63%
% PLECOPTERA	5%
% TRICHOPTERA	19%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	37%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
West Fork Rock Creek - Site 03 - just above Rock Cr & HWY Crossing
RBP kick sample- 60 sec/30 ft - entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Heterlimnius corp.	1	0.6%
Curclionidae	1	0.6%
DIPTERA		
Brillia sp.	1	0.6%
Cricotopus spp.	3	1.9%
Eukiefferiella spp.	1	0.6%
Simulium spp. (Eusimuluim)	1	0.6%
Deuterophlebia sp.	4	2.5%
Chelifera sp.	1	0.6%
EPHEMEROPTERA		
Baetis bicaudatus	8	5.0%
Baetis tricaudatus	53	33.1%
Serratella sp.	8	5.0%
Drunella coloradensis	16	10.0%
Cinygmula spp.	14	8.8%
Epeorus longimanus	17	10.6%
Epeorus deceptivus	17	10.6%
Rhithrogena sp.	2	1.3%
PLECOPTERA		
Doroneuria sp.	4	2.5%
Zapada oregenensis gp.	1	0.6%
TRICHOPTERA		
Neothremma sp.	1	0.6%
Brachycentrus americanus	3	1.9%
Rhyacophila brunnea gp.	2	1.3%
Rhyacophila sibirica gp.	1	0.6%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
West Fork Rock Creek - Site 03 - just above Rock Cr & HWY Crossing
RBP kick sample- 60 sec/30 ft - entire sample used.

TOTAL ORGANISMS	160
TAXA RICHNESS	22
EPT RICHNESS	14
BIOTIC INDEX	2.01
SHANNON DIVERSITY	3.34
METALS TOLERANCE INDEX	2.42
EPT/(EPT + Chironomidae)	0.97
% DOMINANT TAXON	33%
% COLLECTOR-GATHERERS	46%
% SHREDDERS	2%
% SCRAPERS	46%
% FILTERERS	1%
% PREDATORS	5%
% CHIRONOMIDAE	3%
% COLEOPTERA	1%
% DIPTERA	7%
% EPHEMEROPTERA	84%
% PLECOPTERA	3%
% TRICHOPTERA	4%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	45%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA

Snowshoe Creek Lincoln Co., MT- below Snowshoe Mine lower end of reclamat
RBP kick sample- ST1992-6 - 8/14/92- 93sec/15ft - entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Heterlimnius corp.	4	1.8%
Deronectes sp.	3	1.4%
Heteroceriidae	1	0.5%
DIPTERA		
Thienemanniimyia gp.	2	0.9%
Pagastia sp.	1	0.5%
Eukiefferiella spp.	13	5.9%
Tvetenia sp.	17	7.7%
Simulium spp. (Eusimuliuim)	2	0.9%
Oreogeton sp.	22	9.9%
Clinocera sp.	3	1.4%
EPHEMEROPTERA		
Baetis tricaudatus	5	2.3%
Drunella coloradensis	10	4.5%
Drunella doddsi	10	4.5%
Epeorus grandis	2	0.9%
PLECOPTERA		
Leuctridae	2	0.9%
Visoka cateractae	1	0.5%
Zapada columbiana	55	24.8%
Zapada oregenensis gp.	4	1.8%
Setvena bradleyi	25	11.3%
Yoraperla sp.	3	1.4%
Chloroperlinae	4	1.8%
TRICHOPTERA		
Parapsyche sp.	13	5.9%
Ecclisomyia sp.	1	0.5%
Neothremma sp.	1	0.5%
Rhyacophila angelita gp.	1	0.5%
Rhyacophila hylinata gp.	15	6.8%
Rhyacophila sibirica gp.	2	0.9%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Snowshoe Creek Lincoln Co., MT- above Snowshoe Mine and reclamation
RBP kick sample- ST1992-6a - 8/14/92 - not timed/4 ft - entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Heterlimnius corp.	14	5.2%
Heteroceridae	1	0.4%
DIPTERA		
Pagastia sp.	1	0.4%
Brillia sp.	1	0.4%
Cricotopus spp.	1	0.4%
Eukiefferiella spp.	4	1.5%
Tvetenia sp.	1	0.4%
Micropsectra spp.	3	1.1%
Oreogeton sp.	2	0.7%
EPHEMEROPTERA		
Baetis tricaudatus	10	3.7%
Ameletus spp.	34	12.7%
Drunella coloradensis	4	1.5%
Drunella doddsi	4	1.5%
Epeorus grandis	4	1.5%
Ironodes sp.	1	0.4%
PLECOPTERA		
Doroneuria sp.	8	3.0%
Visoka cataractae	1	0.4%
Zapada cinctipes	3	1.1%
Zapada columbiana	60	22.5%
Zapada oregonensis gp.	1	0.4%
Megarcys sp.	9	3.4%
Setvena bradleyi	9	3.4%
Yoraperla sp.	8	3.0%
TRICHOPTERA		
Parapsyche sp.	22	8.2%
Neothremma sp.	33	12.4%
Rhyacophila betteni gp.	1	0.4%
Rhyacophila brunnea gp.	1	0.4%
Rhyacophila angelita gp.	1	0.4%
Rhyacophila hyalinata gp.	9	3.4%
Rhyacophila sibirica gp.	6	2.2%
OTHER		
Turbellaria	6	2.2%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Snowshoe Creek Lincoln Co., MT- below Snowshoe Mine lower end of reclamat
RBP kick sample- ST1992-6 - 8/14/92- 93sec/15ft - entire sample used.

TOTAL ORGANISMS	222
TAXA RICHNESS	27
EPT RICHNESS	17
BIOTIC INDEX	2.26
SHANNON DIVERSITY	3.82
METALS TOLERANCE INDEX	3.06
EPT/(EPT + Chironomidae)	0.82
% DOMINANT TAXON	25%
% COLLECTOR-GATHERERS	18%
% SHREDDERS	29%
% SCRAPERS	10%
% FILTERERS	7%
% PREDATORS	35%
% CHIRONOMIDAE	15%
% COLEOPTERA	4%
% DIPTERA	27%
% EPHEMEROPTERA	12%
% PLECOPTERA	42%
% TRICHOPTERA	15%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	19%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA

Snowshoe Creek Lincoln Co., MT- above Snowshoe Mine and reclamation

RBP kick sample- ST1992-6a - 8/14/92 - not timed/4 ft - entire sample used.

TOTAL ORGANISMS	267
TAXA RICHNESS	31
EPT RICHNESS	21
BIOTIC INDEX	1.38
SHANNON DIVERSITY	3.95
METALS TOLERANCE INDEX	1.90
EPT/(EPT + Chironomidae)	0.95
% DOMINANT TAXON	22%
% COLLECTOR-GATHERERS	25%
% SHREDDERS	29%
% SCRAPERS	17%
% FILTERERS	8%
% PREDATORS	19%
% CHIRONOMIDAE	4%
% COLEOPTERA	6%
% DIPTERA	5%
% EPHEMEROPTERA	21%
% PLECOPTERA	39%
% TRICHOPTERA	27%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	2%
Baetidae/EPHEMEROPTERA	18%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA

Tobacco River near mouth (~1/2 way between mouth& HWY 37) - 8/13/92
RBP kick sample -108 sec/50 ft - entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Optioservus spp.	41	19.0%
DIPTERA		
Potthastia sp.	3	1.4%
Cricotopus spp.	2	0.9%
Eukiefferiella spp.	1	0.5%
Orthocladius spp.	1	0.5%
Rheotanytarsus sp.	2	0.9%
Micropsectra spp.	2	0.9%
Antocha sp.	10	4.6%
Hexatoma sp.	3	1.4%
Simulium spp. (Prosimulium)	1	0.5%
Empididae	2	0.9%
EPHEMEROPTERA		
Acentrella insignificans	1	0.5%
Baetis tricaudatus	7	3.2%
Serratella sp.	1	0.5%
Timpanoga hecuba	1	0.5%
Nixe sp.	7	3.2%
Ironodes sp.	5	2.3%
Rhithrogena sp.	1	0.5%
PLECOPTERA		
Claassenia sabulosa	1	0.5%
Hesperoperla pacifica	12	5.6%
Skwala sp.	9	4.2%
Pteronarcys sp.	3	1.4%
Chloroperlinae	1	0.5%
TRICHOPTERA		
Hydropsyche oslari	40	18.5%
Arctopsyche sp.	14	6.5%
Brachycentrus occidentalis	27	12.5%
Glossosoma sp.	2	0.9%
Rhyacophila angelita gp.	12	5.6%
Rhyacophila brunnea gp.	4	1.9%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Tobacco River near mouth (~1/2 way between mouth& HWY 37) - 8/13/92

RBP kick sample -108 sec/50 ft - entire sample used.

TOTAL ORGANISMS	216
TAXA RICHNESS	29
EPT RICHNESS	18
BIOTIC INDEX	3.20
SHANNON DIVERSITY	3.84
METALS TOLERANCE INDEX	3.58
EPT/(EPT + Chironomidae)	0.93
% DOMINANT TAXON	19%
% COLLECTOR-GATHERERS	13%
% SHREDDERS	1%
% SCRAPERS	26%
% FILTERERS	39%
% PREDATORS	20%
% CHIRONOMIDAE	5%
% COLEOPTERA	19%
% DIPTERA	13%
% EPHEMEROPTERA	11%
% PLECOPTERA	12%
% TRICHOPTERA	46%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	35%
Hydropsychinae/TRICH	40%

AQUATIC MACROINVERTEBRATE DATA
Wolf Cr. – 650 ft downstream of Rd 736 bridge, near mouth - 8/11/92
RBP kick sample - 62 sec/22 ft - subsample from ~ 1,600 organisms

Taxon	Number	%RA
COLEOPTERA		
Optioservus spp.	18	5.7%
Zaitzevia par.	12	3.8%
DIPTERA		
Potthastia sp.	1	0.3%
Cricotopus spp.	135	42.6%
Cricotopus tostococladius	5	1.6%
Eukiefferiella spp.	39	12.3%
Nanocladius sp.	1	0.3%
Rheocricotopus sp.	16	5.0%
Polypedilum sp.	8	2.5%
Rheotanytarsus sp.	1	0.3%
Antocha sp.	2	0.6%
Atherix sp.	3	0.9%
EPHEMEROPTERA		
Acentrella insignificans	1	0.3%
Baetis tricaudatus	1	0.3%
PLECOPTERA		
Calineuria californica	5	1.6%
Skwala sp.	1	0.3%
Pteronarcys sp.	2	0.6%
TRICHOPTERA		
Hydropsyche oslari	12	3.8%
Leucotrichia sp.	2	0.6%
Ochrotrichia sp.	8	2.5%
Brachycentrus americanus	5	1.6%
Lepidostoma sp.	31	9.8%
Rhyacophila coloradensis gp.	3	0.9%
LEPIDOPTERA		
Petrophila sp.	3	0.9%
ANNELIDA		
Naididae	2	0.6%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Wolf Cr. ~ 650 ft downstream of Rd 736 bridge, near mouth - 8/11/92
RBP kick sample - 62 sec/22 ft - subsample from ~ 1,600 organisms

TOTAL ORGANISMS	317
TAXA RICHNESS	25
EPT RICHNESS	11
BIOTIC INDEX	5.56
SHANNON DIVERSITY	3.12
METALS TOLERANCE INDEX	6.33
EPT/(EPT + Chironomidae)	0.26
% DOMINANT TAXON	43%
% COLLECTOR-GATHERERS	69%
% SHREDDERS	15%
% SCRAPERS	9%
% FILTERERS	4%
% PREDATORS	4%
% CHIRONOMIDAE	65%
% COLEOPTERA	9%
% DIPTERA	67%
% EPHEMEROPTERA	1%
% PLECOPTERA	3%
% TRICHOPTERA	19%
% misc INSECTS	1%
% ANNELIDA	1%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	100%
Hydropsychinae/TRICH	20%

APPENDIX C

Macroinvertebrate data - foothill and valley streams 1992

C.1 Checklist with FFG designations, metals and biotic index tolerance values

C.2 Raw data and metrics

Appendix C.1. Checklist of macroinvertebrates from foothill and valley streams with Functional Feeding Group (FFG) designations, metals (MTI) and biotic (BI) tolerance values.

Taxon	FFG	MTI	BI
COLEOPTERA			
Cleptelmis ornata	4	4	4
Heterlimnius corp.	4	3	3
Narpus sp.	3	1	2
Optioservus spp.	1	5	5
Zaitzevia parvula	4	3	4
Helichus sp.		2	2
Agabus sp.	5	7	5
Oreodytes sp.	5	7	5
Brychius sp.	3	5	5
Curculionidae			
DIPTERA			
Thienemannimyia gp.	5	4	5
Pagastia sp.	4	9	1
Potthastia sp.	4	5	2
Brillia sp.	3	4	4
Cardiocladius sp.	5	9	5
Corynoneura sp.	4	4	7
Cricotopus spp.	4	9	7
Cricotopus nostococladius	3	5	6
Eukiefferiella spp.	4	9	8
Orthocladius spp.	4	5	6
Paraphaenocladius sp.	4	4	4
Rheocricotopus sp.	4	5	4
Tvetenia sp.	4	4	5
Dicrotendipes sp.	4	5	8
Microtendipes sp.	4	4	6
Phaenopsectra sp.	4	4	7
Polypedilum sp.	4	4	6
Micropsectra spp.	4	1	4
Rheotanytarsus sp.	2	1	6
Antocha sp.	4	4	3
Dicranota sp.	5	2	3
Hexatoma sp.	5	2	2
Tipula sp.	3	4	4
Simulium,spp. (Eusimuliur	2	5	5
Ceratopogoninae	5	4	6
Atherix sp.	5	5	5
Limnophora sp.	5	7	6

Taxon	FFG	MTI	BI
EPHEMEROPTERA			
Acentrella insignificans	4	4	4
Baetis punctiventris	4	3	6
Baetis tricaudatus	4	5	4
Ameletus spp.	4	1	0
Attenella margarita	4	1	3
Serratella sp.	4	1	2
Drunella doddsi	1	0	1
Drunella grandis	4	1	2
Drunella spinifera	4	0	0
Caudatella hystrix	1	0	0
Ephemerella inermis	4	3	4
Timpanoga hecuba	4	1	2
Cinygmula spp.	1	0	0
Epeorus albertae	1	0	2
Epeorus longimanus	1	0	1
Heptagenia sp.	1	1	4
Nixe sp.	1	1	4
Rhithrogena sp.	1	2	0
Choroterpes albiannulata	2	1	2
Paraleptophlebia sp.	4	1	1
Paraleptophlebia bicornuta	4	1	2
Tricorythodes sp.	4	4	4
PLECOPTERA			
Calineuria californica	5	3	2
Claassenia sabulosa	5	3	3
Doroneuria sp.	5	2	0
Hesperoperla pacifica	5	3	1
Pteronarcella badia	3	4	3
Pteronarcys sp.	3	2	2
Taenionema sp.	3	2	2
Amphinemura sp.	3	1	2
Zapada cinctipes	3	3	3
Isogenoides sp.	5	2	3
Skwala sp.	5	3	3
Isoperla sp.	5	3	2
Yoraperla sp.	3	0	0
Chloroperlinae	5	2	1

Appendix C.1. Checklist of macroinvertebrates from foothill and valley streams with Functional Feeding Group (FFG) designations, metals (MTI) and biotic (BI) tolerance values.

Taxon	FFG	MTI	BI	Taxon	FFG	MTI	BI
TRICHOPTERA				LEPIDOPTERA			
Cheumatopsyche sp.	2	5	6	*Petrophila sp.*	1	3	5
Hydropsyche oslari	2	5	3				
Hydropsyche occidentalis	2	5	5	ODONATA			
Hydropsyche cockerelli	2	4	4	*Ophiogomphus sp.*	5	4	5
Arctopsyche sp.	2	2	3				
Apatania sp.	1	2	3	ANNELIDA			
Ecclisomyia sp.	4	2	4	Lumbricidae	4	1	4
Neophylax sp.	1	2	3				
Psychoglypha sp.	4	2	0	MOLLUSCA			
Agrayleia sp.	3	2	8	*Physella sp.*	1	4	8
Hydroptila sp.	4	4	6				
Ochrotrichia sp.	3	3	4				
Nectopsyche sp.	3	2	3				
Oecetis sp.	5	3	8				
Amiocentrus aspilus	4	1	3				
Brachycentrus americanus	1	4	1				
Brachycentrus occidentali	2	3	2				
Micrasema sp.	3	2	1				
Lepidostoma sp.	3	1	1				
Glossosoma sp.	1	2	1				
Rhyacophila angelita gp.	5	1	1				
Rhyacophila brunnea gp.	5	1	2				

ID's by D. McGuire

FFG: scraper = 1, filterer = 2, shredder = 3, collector-gatherer = 4, predator = 5

APPENDIX C.2

Macroinvertebrate data foothill and valley streams 1992

raw data and metrics

Bridger Creek

Elkhorn Creek

Lower Deer Creek

Redlodge Creek

Shields River #1

Shields River #2

Upper Deer Creek

Willow Creek

West Fork Bitterroot River

AQUATIC MACROINVERTEBRATE DATA
Bridger Creek, Sweetgrass Co., MT- 120 yds above first road S. of I-90 7/31/92
RBP kick sample- ST1992-3 - 81sec/41ft - entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Optioservus spp.	57	18.4%
Zaitzevia par.	1	0.3%
Curculionidae	2	0.6%
Helichus sp.	1	0.3%
DIPTERA		
Pagastia sp.	11	3.6%
Cardiocladius sp.	11	3.6%
Cricotopus spp.	1	0.3%
Eukiefferiella spp.	8	2.6%
Tvetenia sp.	8	2.6%
Polypedilum sp.	1	0.3%
Micropsectra spp.	2	0.6%
Rheotanytarsus sp.	17	5.5%
Simulium spp. (Eusimulium)	80	25.9%
EPHEMEROPTERA		
Baetis tricaudatus	29	9.4%
Cinygmula spp.	3	1.0%
Epeorus albertae	32	10.4%
Epeorus longimanus	10	3.2%
Nixe sp.	5	1.6%
PLECOPTERA		
Claassenia sabulosa	1	0.3%
Hesperoperla pacifica	1	0.3%
Malenka sp.	5	1.6%
Skwala sp.	7	2.3%
Chloroperlinae	1	0.3%
TRICHOPTERA		
Arctopsyche sp.	1	0.3%
Hydroptila sp.	1	0.3%
Brachycentrus americanus	3	1.0%
Micrasema sp.	1	0.3%
Agapetus sp.	1	0.3%
ANNELIDA		
Lumbricidae	7	2.3%
MOLLUSCA		
Physella sp.	1	0.3%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Bridger Creek, Sweetgrass Co., MT- 120 yds above first road S. of I-90 7/31/92

RBP kick sample- ST1992-3 - 81sec/41ft - entire sample used.

TOTAL ORGANISMS	309
TAXA RICHNESS	30
EPT RICHNESS	15
BIOTIC INDEX	4.45
SHANNON DIVERSITY	3.60
METALS TOLERANCE INDEX	3.75
EPT/(EPT + Chironomidae)	0.63
% DOMINANT TAXON	26%
% COLLECTOR-GATHERERS	22%
% SHREDDERS	2%
% SCRAPERS	36%
% FILTERERS	32%
% PREDATORS	7%
% CHIRONOMIDAE	19%
% COLEOPTERA	20%
% DIPTERA	45%
% EPHEMEROPTERA	26%
% PLECOPTERA	5%
% TRICHOPTERA	2%
% misc INSECTS	0%
% ANNELIDA	2%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	37%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
Elkhorn Creek - 2 mi. below Elkhorn City @ crossing- 7/29/92
RBP kick sample- - 40 sec/50 ft - entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Cleptelmis ornata	5	2.2%
Heterlimnius corp.	43	19.1%
Narpus sp.	1	0.4%
Oreodytes sp.	6	2.7%
DIPTERA		
Pagastia sp.	1	0.4%
Potthastia sp.	2	0.9%
Corynoneura sp.	1	0.4%
Cricotopus spp.	6	2.7%
Cricotopus nostococladius	21	9.3%
Eukiefferiella spp.	4	1.8%
Orthocladius spp.	4	1.8%
Rheocricotopus sp.	1	0.4%
Micropsectra spp.	2	0.9%
EPHEMEROPTERA		
Baetis tricaudatus	1	0.4%
Ameletus spp.	8	3.6%
Serratella sp.	12	5.3%
Drunella grandis	4	1.8%
Cinygmula spp.	11	4.9%
Epeorus longimanus	1	0.4%
PLECOPTERA		
Hesperoperla pacifica	3	1.3%
Zapada cinctipes	2	0.9%
Chloroperlinae	2	0.9%
TRICHOPTERA		
Arctopsyche sp.	1	0.4%
Apatania sp.	1	0.4%
Neophylax sp.	1	0.4%
Psychoglypha sp.	1	0.4%
Micrasema sp.	78	34.7%
Lepidostoma sp.	1	0.4%
ANNELIDA		
Lumbricidae	1	0.4%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Elkhorn Creek - 2 mi. below Elkhorn City @ crossing- 7/29/92

RBP kick sample- - 40 sec/50 ft - entire sample used.

TOTAL ORGANISMS	225
TAXA RICHNESS	29
EPT RICHNESS	15
BIOTIC INDEX	2.51
SHANNON DIVERSITY	3.37
METALS TOLERANCE INDEX	3.23
EPT/(EPT + Chironomidae)	0.75
% DOMINANT TAXON	35%
% COLLECTOR-GATHERERS	43%
% SHREDDERS	46%
% SCRAPERS	6%
% FILTERERS	0%
% PREDATORS	5%
% CHIRONOMIDAE	19%
% COLEOPTERA	24%
% DIPTERA	19%
% EPHEMEROPTERA	16%
% PLECOPTERA	3%
% TRICHOPTERA	37%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	3%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
Lower Deer Creek, Sweetgrass Co., MT- 75 ft above frontage road bridge 7/29/92
RBP kick sample- ST1992-2 - 71scc/47ft - entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Optioservus spp.	11	4.6%
DIPTERA		
Pagastia sp.	7	2.9%
Cardiocladius sp.	26	10.9%
Eukiefferiella spp.	19	8.0%
Paraphaenocladius sp.	6	2.5%
Tvetenia sp.	8	3.4%
Polypedilum sp.	8	3.4%
Micropsectra spp.	7	2.9%
Rheotanytarsus sp.	41	17.2%
Antocha sp.	1	0.4%
Hexatoma sp.	1	0.4%
Simulium spp. (Eusimulium)	21	8.8%
EPHEMEROPTERA		
Baetis tricaudatus	53	22.3%
Serratella sp.	3	1.3%
Drunella grandis	1	0.4%
Nixe sp.	2	0.8%
PLECOPTERA		
Doroneuria sp.	4	1.7%
Hesperoperla pacifica	5	2.1%
TRICHOPTERA		
Hydropsyche oslari	3	1.3%
Psychoglypha sp.	1	0.4%
Hydroptila sp.	1	0.4%
Brachycentrus occidentalis	6	2.5%
Rhyacophila angelita gp.	1	0.4%
ANNELIDA		
Lumbricidae	2	0.8%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Lower Deer Creek, Sweetgrass Co., MT- 75 ft above frontage road bridge 7/29/92
RBP kick sample- ST1992-2 - 71sec/47ft - entire sample used.

TOTAL ORGANISMS	238
TAXA RICHNESS	24
EPT RICHNESS	11
BIOTIC INDEX	4.70
SHANNON DIVERSITY	3.66
METALS TOLERANCE INDEX	4.65
EPT/(EPT + Chironomidae)	0.40
% DOMINANT TAXON	22%
% COLLECTOR-GATHERERS	49%
% SHREDDERS	0%
% SCRAPERS	5%
% FILTERERS	30%
% PREDATORS	16%
% CHIRONOMIDAE	51%
% COLEOPTERA	5%
% DIPTERA	61%
% EPHEMEROPTERA	25%
% PLECOPTERA	4%
% TRICHOPTERA	5%
% misc INSECTS	0%
% ANNELIDA	1%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	90%
Hydropsychinae/TRICH	25%

AQUATIC MACROINVERTEBRATE DATA
Redlodge Creek below Cooney- Dam Reach 1 - 8/20/92
RBP kick sample- 40 sec/50 ft - subsample from ~ 600 organisms

Taxon	Number	%RA
DIPTERA		
Pagastia sp.	1	0.3%
Cardiocladius sp.	22	7.3%
Cricotopus spp.	20	6.6%
Tvetenia sp.	11	3.6%
Paratanytarsus sp.	4	1.3%
Simulium spp.	6	2.0%
Clinocera sp.	1	0.3%
EPHEMEROPTERA		
Acentrella insignificans	1	0.3%
Baetis tricaudatus	25	8.3%
Ephemerella inermis	11	3.6%
Nixe sp.	1	0.3%
Tricorythodes sp.	52	17.2%
TRICHOPTERA		
Cheumatopsyche sp.	119	39.3%
Hydropsyche spp.	25	8.3%
Amiocentrus aspilus	1	0.3%
ANNELIDA		
Lumbricidae	3	1.0%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Redlodge Creek below Cooney- Dam Reach 1 - 8/20/92

RBP kick sample- 40 sec/50 ft - subsample from ~ 600 organisms

TOTAL ORGANISMS	303
TAXA RICHNESS	16
EPT RICHNESS	8
BIOTICINDEX	5.23
SHANNON DIVERSITY	2.84
METALS TOLERANCE INDEX	5.04
EPT/(EPT + Chironomidae)	0.80
% DOMINANT TAXON	39%
% COLLECTOR-GATHERERS	43%
% SHREDDERS	0%
% SCRAPERS	0%
% FILTERERS	50%
% PREDATORS	8%
% CHIRONOMIDAE	19%
% COLEOPTERA	0%
% DIPTERA	21%
% EPHEMEROPTERA	30%
% PLECOPTERA	0%
% TRICHOPTERA	48%
% misc INSECTS	0%
% ANNELIDA	1%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	29%
Hydropsychinae/TRICH	99%

AQUATIC MACROINVERTEBRATE DATA
Shields River at road crossing -3 mi. below N.F.
RBP kick sample- entire sample used.

Taxon	Number	%RA
COLEOPTERA		
Optioservus spp.	8	2.8%
DIPTERA		
Eukiefferiella spp.	2	0.7%
Hexatoma sp.	1	0.4%
EPHEMEROPTERA		
Serratella sp.	1	0.4%
Drunella doddsi	10	3.5%
Drunella spinifera	2	0.7%
Caudatella hystrix	5	1.8%
Ephem...ella inermis	14	4.9%
Cinygmula ...	103	36.4%
Rhithrogena sp.	68	24.0%
PLECOPTERA		
Doroneuria sp.	5	1.8%
Taenionema sp.	35	12.4%
Zapada cinctipes	4	1.4%
Skwala sp.	1	0.4%
Chloroperlinae	3	1.1%
TRICHOPTERA		
Arctopsyche sp.	15	5.3%
Apatania sp.	2	0.7%
Eclisomyia sp.	1	0.4%
Glossosoma sp.	1	0.4%
Rhyacophila brunnea gp.	2	0.7%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Shields River at road crossing -3 mi. below N.F.
RBP kick sample- entire sample used.

TOTAL ORGANISMS	283
TAXA RICHNESS	20
EPT RICHNESS	17
BIOTIC INDEX	1.10
SHANNON DIVERSITY	2.86
METALS TOLERANCE INDEX	1.22
EPT/(EPT + Chironomidae)	0.99
% DOMINANT TAXON	36%
% COLLECTOR-GATHERERS	7%
% SHREDDERS	14%
% SCRAPERS	70%
% FILTERERS	5%
% PREDATORS	4%
% CHIRONOMIDAE	1%
% COLEOPTERA	3%
% DIPTERA	1%
% EPHEMEROPTERA	72%
% PLECOPTERA	17%
% TRICHOPTERA	7%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	0%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
Shields River near mouth - 10/7/92
RBP kick sample- 45 sec/15 ft

Taxon	Number	%RA
COLEOPTERA		
Optioservus spp.	6	2.2%
Zaitzevia par.	4	1.4%
Oreodytes sp.	1	0.4%
DIPTERA		
Cricotopus spp.	13	4.7%
Eukiefferiella spp.	4	1.4%
Orthocladius spp.	1	0.4%
Dicrotendipes sp.	1	0.4%
Microtendipes sp.	3	1.1%
Hexatoma sp.	9	3.3%
Tipula sp.	4	1.4%
Simulium spp. (Eusimulium)	25	9.1%
EPHEMEROPTERA		
Acentrella insignificans	1	0.4%
Baetis tricaudatus	13	4.7%
Ephemerella inermis	20	7.2%
Heptagenia sp.	3	1.1%
Rhithrogena sp.	38	13.8%
Tricorythodes sp.	7	2.5%
PLECOPTERA		
Claassenia sabulosa	1	0.4%
Isogenoides sp.	2	0.7%
Skwala sp.	9	3.3%
Isoperla sp.	6	2.2%
Pteronarcella badia	9	3.3%
Chloroperlinae	1	0.4%
TRICHOPTERA		
Cheumatopsyche sp.	1	0.4%
Hydropsyche spp.	84	30.4%
Hydroptila sp.	1	0.4%
Oecetis sp.	3	1.1%
Lepidostoma sp.	5	1.8%
MOLLUSCA		
Physella sp.	1	0.4%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Shields River near mouth - 10/7/92
RBP kick sample- 45 sec/15 ft

TOTAL ORGANISMS	276
TAXA RICHNESS	29
EPT RICHNESS	17
BIOTIC INDEX	3.97
SHANNON DIVERSITY	3.68
METALS TOLERANCE INDEX	4.13
EPT/(EPT + Chironomidae)	0.90
% DOMINANT TAXON	30%
% COLLECTOR-GATHERERS	25%
% SHREDDERS	7%
% SCRAPERS	17%
% FILTERERS	40%
% PREDATORS	12%
% CHIRONOMIDAE	8%
% COLEOPTERA	4%
% DIPTERA	22%
% EPHEMEROPTERA	30%
% PLECOPTERA	10%
% TRICHOPTERA	34%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	17%
Hydropsychinae/TRICH	90%

AQUATIC MACROINVERTEBRATE DATA

Upper Deer Creek, Sweetgrass Co., MT- 220 ft below frontage road bridge- 7/29/92

RBP kick sample - ST1992-1 - 93cc/40ft - subsample from ~ 450 organisms

Taxon	Number	%RA
COLEOPTERA		
Agabus sp.	3	1.0%
DIPTERA		
Thienemannimyia gp.	1	0.3%
Pagastia sp.	1	0.3%
Cardiocladius sp.	35	12.1%
Cricotopus spp.	15	5.3%
Eukiefferiella spp.	14	4.8%
Paraphaenocladius sp.	1	0.3%
Tvetenia sp.	20	6.9%
Phaenopsectra sp.	2	0.7%
Polypedilum sp.	3	1.0%
Micropsectra spp.	7	2.4%
Rheotanytarsus sp.	7	2.4%
Dicranota sp.	1	0.3%
Hexatoma sp.	3	1.0%
Simulium spp. (Eusimulium)	71	24.5%
Ceratopogoninae	1	0.3%
Limnophora sp.	1	0.3%
EPHEMEROPTERA		
Acentrella insignificans	9	3.1%
Baetis tricaudatus	50	17.2%
Epeorus albertae	9	3.1%
Nixe sp.	10	3.4%
Paraleptophlebia sp.	1	0.3%
Paraleptophlebia bicornuta	4	1.4%
Tricorythodes sp.	4	1.4%
PLECOPTERA		
Hesperoperla pacifica	2	0.7%
Amphinemura sp.	1	0.3%
Zapada cinctipes	2	0.7%
Chloroperlinae	1	0.3%
TRICHOPTERA		
Brachycentrus occidentalis	6	2.1%
ANNELIDA		
Lumbricidae	4	1.4%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA
Upper Deer Creek, Sweetgrass Co., MT- 220 ft below frontage road bridge- 7/29/92
RBP kick sample - ST1992-1 - 93sec/40ft - subsample from ~ 450 organisms

TOTAL ORGANISMS	290
TAXA RICHNESS	30
EPT RICHNESS	12
BIOTIC INDEX	4.70
SHANNON DIVERSITY	3.73
METALS TOLERANCE INDEX	5.06
EPT/(EPT + Chironomidae)	0.48
% DOMINANT TAXON	24%
% COLLECTOR-GATHERERS	47%
% SHREDDERS	1%
% SCRAPERS	7%
% FILTERERS	29%
% PREDATORS	17%
% CHIRONOMIDAE	37%
% COLEOPTERA	1%
% DIPTERA	62%
% EPHEMEROPTERA	30%
% PLECOPTERA	2%
% TRICHOPTERA	2%
% misc INSECTS	0%
% ANNELIDA	1%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	68%
Hydropsychinae/TRICH	0%

AQUATIC MACROINVERTEBRATE DATA
Willow Creek, Carbon Co., MT- near mouth at Cooney Res. 8/20/92
RBP kick sample- 40sec/50ft - subsample from ~ 500 organisms

Taxon	Number	%RA
COLEOPTERA		
Optioservus spp.	1	0.3%
DIPTERA		
Thienemannimyia gr.	1	0.3%
Pagastia sp.	1	0.3%
Cardiocladius sp.	65	21.2%
Cricotopus spp.	44	14.4%
Eukiefferiella spp.	2	0.7%
Rheocricotopus sp.	4	1.3%
Tvetenia sp.	15	4.9%
Polypedilum sp.	32	10.5%
Hexatoma sp.	2	0.7%
Simulium spp. (Eusimuluim)	1	0.3%
EPHEMEROPTERA		
Acentrella insignificans	23	7.5%
Baetis puntiventris	13	4.2%
Baetis tricaudatus	7	2.3%
Ephemerella inermis	2	0.7%
Heptagenia sp.	2	0.7%
Choroterpes albiannulata	2	0.7%
Tricorythodes sp.	28	9.2%
PLECOPTERA		
Isogenoides sp.	2	0.7%
TRICHOPTERA		
Cheumatopsyche sp.	15	4.9%
Hydropsyche spp.	29	9.5%
Hydroptila sp.	2	0.7%
Ochrotrichia sp.	3	1.0%
Nectopsyche sp.	5	1.6%
Oecetis sp.	1	0.3%
Amiocentrus aspilus	1	0.3%
LEPIDOPTERA		
Petrophila sp.	1	0.3%
ODONATA		
Ophiogomphus sp.	2	0.7%

ID's by D. McGuire

AQUATIC MACROINVERTEBRATE DATA

Willow Creek, Carbon Co., MT- near mouth at Cooney Res. 8/20/92

RBP kick sample- 40sec/50ft - subsample from ~ 500 organisms

TOTAL ORGANISMS	306
TAXA RICHNESS	28
EPT RICHNESS	17
BIOTIC INDEX	5.20
SHANNON DIVERSITY	3.69
METALS TOLERANCE INDEX	5.40
EPT/(EPT + Chironomidae)	0.46
% DOMINANT TAXON	21%
% COLLECTOR-GATHERERS	57%
% SHREDDERS	3%
% SCRAPERS	1%
% FILTERERS	15%
% PREDATORS	24%
% CHIRONOMIDAE	54%
% COLEOPTERA	0%
% DIPTERA	55%
% EPHEMEROPTERA	25%
% PLECOPTERA	1%
% TRICHOPTERA	18%
% misc INSECTS	1%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	56%
Hydropsychinae/TRICH	79%

AQUATIC MACROINVERTEBRATE DATA
West Fork Bitterroot River - 100 yds above W.F. Ranger Station drive- 9/2/92
RBP kick sample - 143cec/42ft - subsample from – 450 organisms

Taxon	Number	%RA
COLEOPTERA		
Narpus sp.	2	0.7%
Optioservus spp.	4	1.4%
Zaitzevia par.	5	1.8%
Brychius sp.	2	0.7%
DIPTERA		
Pagastia sp.	1	0.4%
Potthastia sp.	1	0.4%
Brillia sp.	2	0.7%
Cardiocladius sp.	2	0.7%
Cricotopus spp.	21	7.6%
Eukiefferiella spp.	2	0.7%
Orthocladius spp.	1	0.4%
Paraphaenocladius sp.	1	0.4%
Tvetenia sp.	38	13.8%
Microtendipes sp.	1	0.4%
Polypedilum sp.	1	0.4%
Micropsectra spp.	21	7.6%
Hexatoma sp.	3	1.1%
Simulium spp. (Eusimulium)	1	0.4%
Atherix sp.	2	0.7%
EPHEMEROPTERA		
Acentrella insignificans	3	1.1%
Baetis tricaudatus	9	3.3%
Ameletta margarita	3	1.1%
Serratella sp.	8	2.9%
Drunella doddsi	5	1.8%
Drunella grandis	11	4.0%
Timpanoga hecuba	1	0.4%
Epeorus longimanus	1	0.4%
Rhithrogena sp.	12	4.3%
Paraleptophlebia bicornuta	4	1.4%
PLECOPTERA		
Calineuria californica	10	3.6%
Hesperoperla pacifica	2	0.7%
Zapada cinctipes	5	1.8%
Yoraperla sp.	2	0.7%
Pteronarcys sp.	6	2.2%

AQUATIC MACROINVERTEBRATE DATA
West Fork Bitterroot River - 100 yds above W.F. Ranger Station drive- 9/2/92
RBP kick sample - 143sec/42ft - subsample from ~ 450 organisms

Taxon	Number	%RA
TRICHOPTERA		
Cheumatopsyche sp.	1	0.4%
Hydropsyche cockerelli	57	20.7%
Arctopsyche sp.	18	6.5%
Apatania sp.	3	1.1%
Agrayle[illegible] sp.	2	0.7%
Brachycentrus americanus	2	0.7%

ID's by D. McGuire

TOTAL ORGANISMS	276
TAXA RICHNESS	40
EPT RICHNESS	21
BIOTIC INDEX	3.94
SHANNON DIVERSITY	4.25
METALS TOLERANCE INDEX	3.47
EPT/(EPT + Chironomidae)	0.64
% DOMINANT TAXON	21%
% COLLECTOR-GATHERERS	48%
% SHREDDERS	8%
% SCRAPERS	10%
% FILTERERS	28%
% PREDATORS	7%
% CHIRONOMIDAE	33%
% COLEOPTERA	5%
% DIPTERA	36%
% EPHEMEROPTERA	21%
% PLECOPTERA	9%
% TRICHOPTERA	30%
% misc INSECTS	0%
% ANNELIDA	0%
% MOLLUSCA	0%
% CRUSTACEA	0%
% misc NONINSECTS	0%
Baetidae/EPHEMEROPTERA	21%
Hydropsychinae/TRICH	70%